**RECENT HEALTHCARE PROVIDER PERCEPTIONS OF THE HUMAN PAPILLOMAVIRUS VACCINE: A LITERATURE REVIEW**

by

Marissa Elana Baron

BS, University of Wisconsin-Madison, 2015

Submitted to the Graduate Faculty of

Graduate School of Public Health in partial fulfillment

of the requirements for the degree of

Master of Public Health

University of Pittsburgh

2016

**ABSTRACT**

UNIVERSITY OF PITTSBURGH

GRADUATE SCHOOL OF PUBLIC HEALTH

This essay is submitted

by

Marissa Baron

on

December 14, 2016

and approved by

Essay Advisor:

Mackey Friedman, PhD \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Assistant Professor

Infectious Diseases and Microbiology

Graduate School of Public Health

University of Pittsburgh

Essay Reader:

Elizabeth Felter, DrPH \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Assistant Professor

Behavioral and Community Health Sciences

Graduate School of Public Health

University of Pittsburgh

Copyright © by Marissa Baron

2016

Human papillomavirus (HPV) is the most common sexually transmitted disease in the United States and the primary cause of cervical cancer. Approximately 14 million people will contract the virus this year. Luckily, the HPV vaccine provides protection from HPV infection and, therefore, HPV related cancers and conditions. Unfortunately, only 42% of adolescent girls and 28% of adolescent boys have received the recommended three doses of the vaccine. This literature review examines provider perspectives on the HPV vaccine with an emphasis on identifying the barriers and facilitators of vaccination. Thirty articles from the United States were found to meet the selection criteria through a PubMed database search using parameters regarding HPV, providers, and perceptions. Providers not recommending the vaccine, concerns about vaccine safety and side effects, the cost or the perceived cost of the vaccine, and providers not prioritizing the vaccine because it is not mandated for school entry were among the barriers identified. Facilitators of vaccination included repetitive recommendations at each subsequent visit after a vaccine denial and presenting the vaccine as a means of cancer prevention. The reduction of cervical cancer cases is a public health issue that is facilitated by the HPV vaccine. Understanding the perspectives of health care providers is certainly useful and may be essential in efforts to increase the uptake of this vaccine, making these perspectives of public health importance. Ongoing efforts to increase HPV vaccination rates should be designed with an understanding of the current dynamics in play between providers, adolescent patients, and their parents with regards to the HPV vaccine.

Mackey Friedman, PhD

**RECENT HEALTHCARE PROVIDER PERCEPTIONS OF THE HUMAN PAPILLOMAVIRUS VACCINE: A LITERATURE REVIEW**

Marissa Baron, MPH

University of Pittsburgh, 2016

TABLE OF CONTENTS

1.0 Introduction 1

1.1 Review of relevant literature 3

2.0 Methods 6

3.0 results 8

3.1 barriers to vaccination 16

3.2 Facilitators to vaccination 20

3.3 Provider knowledge 21

4.0 discussion 23

5.0 Conclusion 26

bibliography 27

List of tables

Table 1. Characteristics of Included Publications 9

Table 2. Barriers to HPV Vaccination as Described by Providers 19

Table 3. Facilitators to HPV Vaccination as Described by Providers 21

# Introduction

Human papillomavirus is the most common sexually transmitted infection in the United States (Markowitz, et al., 2015). There are an estimated 79 million people in the United States who are currently infected with HPV and an estimated 14 million new infections every year. Half of the new infections of HPV each year occur in 15-24 year olds. While most anogenital HPV infections are self-limiting and resolve on their own, a minority of infections can cause genital warts, cervical cancer, oropharyngeal cancers, and other cancers including of the vulva, vagina, penis, and anus. HPV is found in 99% of cervical cancer cases and is believed to be implicated in 90% of anal cancer cases, 71% of vulvar, vaginal, and penile cancer cases, and 72% of oropharyngeal cancers. There are over 150 types of HPV including 40 types that can infect the anogenital region. HPV type 16 accounts for 50% of cervical cancer cases and HPV type 18 accounts for another 20%. The annual cost of HPV infections in the United States is approximately 8 billion dollars. This exceeds the cost of any other sexually transmitted infection except for HIV. Humans are the only natural reservoir of HPV. The virus is most commonly transmitted through penetrative sexual contact but can also be transmitted through non-penetrative sexual contact and, rarely, through non-sexual routes (CDC, 2015).

The connection between sexual activity and cervical cancer was first discovered in the 1960s. In the 1980s, DNA from HPV was found in cervical cancer cells. Epidemiological studies from the 1990s confirmed the relationship between HPV infections and cervical cancer. In 2006, the FDA approved the first vaccine to protect against HPV. Gardasil, a product of the pharmaceutical company Merck, is a quadrivalent vaccine that protects against HPV types 16, 18, and two others that typically cause genital warts. Gardasil has been approved for use in males and females ages 9-26. In 2009, a second HPV vaccine, Cervarix, was approved by the FDA for use in females ages 9-25. Cervarix is a bivalent vaccine and protects only against HPV types 16 and 18. Merck released a second HPV vaccine, Gardasil-9, a 9-valent vaccine, that was approved by the FDA for use in males and females ages 9-26 in 2014. HPV vaccines are highly immunogenic with 99% of individuals achieving an antibody response to the relevant HPV types one month after receiving the three dose series (CDC, 2015).

Because the vaccines are not effective at protecting against HPV types that individuals have already been exposed to, vaccination ideally occurs before the onset of sexual activity (CDC, 2015). The Advisory Committee on Immunization Practices (ACIP) initially recommended vaccinating all 11-12 year old girls against HPV using the three dose series (Markowitz, et al., 2007). In October of 2011, they amended their recommendation to include vaccinating 11-12 year old boys (CDC, 2011). In October of 2016, the ACIP again changed their recommendation regarding HPV vaccination in adolescents. The ACIP now recommends vaccinating 11-12 year old boys and girls with only a two dose series. When vaccination occurs between ages 9 and 14, two doses are sufficient. When vaccinating 15 to 26 year old adolescents of both sexes, three doses are needed to obtain acceptable protection from HPV infections (CDC, 2016).

Despite clear and convincing scientific evidence as to the individual and public health benefits of the HPV vaccine, many adolescents in the United States are not receiving the vaccination. Nationally, only 63% of 13-17 year old adolescent girls and 50% of 13-17 year old adolescent boys have received at least one dose of the HPV vaccine. Only 42% of girls and 28% of boys have received all three doses in the vaccine series. There is significant variation of vaccination rates among the states. The lowest one or more dose male vaccination rate is 34.8% in Kentucky and the highest is 80.6% in Rhode Island. The lowest one or more dose female vaccination rate is 47.7% in Wyoming and the highest is 87.9% in Rhode Island. The lowest three-dose male vaccination rate is 16.0% in Tennessee and the highest is 58.1% in Rhode Island. The lowest three-dose female vaccination rate is 24.4% in Mississippi and the highest is 68.0% in Rhode Island (Reagan-Steiner, et al., 2016). The high burden of HPV related cancers and conditions will needlessly fall on all of the children who are currently missing this important vaccination.

The purpose of this review is to determine how healthcare providers currently view the HPV vaccine and what they perceive as being barriers and facilitators of vaccination. Identifying how providers think about this vaccine is necessary for accomplishing adequate vaccination rates because providers are the primary source of vaccinations for adolescents in the United States. This review focuses only on recent provider perceptions of the vaccine because the vaccine is relatively new and guidelines and recommendations regarding this vaccine have been in flux since its introduction. These perspectives on the vaccine may be useful in increasing HPV vaccination rates in the future.

## Review of relevant literature

A 2011 review by Bartlett and Peterson focused on parents’, guardians’ and primary care providers’ perspectives of the HPV vaccine. The major barriers to vaccination that they identified were parents’ knowledge and attitudes toward the vaccine and the convenience of getting vaccinated. Parents’ decisions were influenced by their own experiences, including mothers who had received abnormal Pap test results, their concerns about the sexual aspects of HPV, and their concerns about the safety and efficacy of the vaccine. The availability of accurate information regarding HPV and the HPV vaccine also influenced parental and provider perceptions (Bartlett & Peterson, 2011). Mullins, et al. found that vaccine efficacy and the risks and benefits of vaccination were the most significant factors in parental decisions regarding vaccination (Mullins, et al., 2013). Canadian parents who chose vaccination did so primarily due to perceived benefits and cues to action including receiving a recommendation from their provider. Those who chose not to vaccinate were concerned about side effects and perceived a low susceptibility to HPV related conditions and cancers (Krawczyk, et al., 2015). Clark, et al. found that among parents of boys, vaccination was more likely to be initiated when parents trusted their provider and received a strong recommendation. Many parents who chose not to vaccinate their sons did not receive a provider recommendation for the vaccine. They also found that parents view adolescent vaccines in general in a more favorable light than they view the HPV vaccine (Clark, et al, 2016). For adolescent girls, the decision to receive the vaccine relies heavily upon the recommendations of their parents and providers. Education of providers and parents that is focused on disease burden and cancer prevention is essential for increased vaccination rates (Mullins, et al., 2013).

HPV vaccine initiation was more likely when parents had received a recommendation from their provider (Bartlett & Peterson, 2011). However, only about half of providers are recommending same day HPV vaccination, and among those who do recommend the vaccine, the quality of the recommendation is often lacking. Vaccine recommendations are made inconsistently, behind schedule, and without urgency (Gilkey, et al, 2015). Numerous interventions have been implemented to increase HPV vaccination rates and many have been successful. A common theme found in the successful interventions is a dual focus on the community and provider levels (Smulian, et al., 2016). The necessity of these interventions is clear. Reaching a 50% vaccination rate among girls currently aged 12 and under would avert 28,800 lifetime cervical cancer cases and reaching an 80% vaccination rate among these girls would avert 53,300 lifetime cervical cancer cases compared to a 30% vaccination rate (Chesson, et al., 2014). Understanding the current provider perspectives on the HPV vaccine should guide the development and implementation of future interventions aimed at increasing HPV vaccination rates.

# Methods

This review followed Khan, et al.’s five steps to conducting a systematic review as a guide for conducting this rapid review of the literature. The five steps that Khan, et al. proposed are (1) framing the question, (2) identifying relevant literature, (3) assessing study quality, (4) summarizing the evidence, and (5) interpreting the findings (Khan, et al., 2003). After careful consideration, the questions that this review sought to answer were: What are healthcare providers’ beliefs about the HPV vaccine? What barriers do they see to vaccination? What do they see as facilitators to vaccination? And what do they know about HPV, the HPV vaccine, and HPV related cancers and conditions? Relevant literature was collected through a systematic and defined process and pre-determined criteria were used for the selection of articles. Tabulation of the results was planned in advance for summarizing the evidence and an interpretation of the findings followed.

Two searches were performed using the PubMed database to identify articles that met the criteria of this review. One search included the search terms HPV, vaccine or Gardasil, provider, and perceptions, allowing for multiple synonyms and variations on these terms in order to obtain all relevant literature. The condition of HPV included the terms Human Papillomavirus, Human Papilloma Virus, or HPV. The vaccine condition included the terms vaccine, vaccines, vaccination, or Gardasil. The condition of provider included the terms provider, physician, pediatric, nurse, practitioner, and family practice. The condition of perceptions included the terms health knowledge, attitudes, practice, attitude of health personnel, interviews as topic, health surveys, attitude to health, qualitative research, decision making, intention, focus groups, awareness, intent, perceive, and perception. This search included filters for studies conducted in the United States, written in English, and published after January 1, 2013. It yielded 187 articles. The second search included the terms HPV, vaccine or Gardasil, provider, physician, pediatrician, nurse, or practitioner, and perception. No filters were applied to the second search and there was a yield of 100 articles. Several articles were present in both searches.

Titles and abstracts were reviewed and articles were selected for inclusion if they included health care providers as participants and described health care provider perceptions of the HPV vaccine. Articles were excluded if they included health care providers as participants but did not describe the perceptions of health care providers. This criteria was broad and included articles describing provider knowledge of the vaccine, barriers to vaccination, and a multitude of other topics. Articles were only selected if the research exclusively took place in the United States and the article was written in English. Reviews were excluded. Selected articles were included only if the full text was available through the University of Pittsburgh’s PittCatt+ system. Only articles published after January 1, 2013 were included in this review. This timeframe for article publication was established to include only recent perceptions of the HPV vaccine. In addition, the Centers for Disease Control and Prevention (CDC)’s Advisory Committee on Immunization Practices (ACIP) changed their recommendation regarding the HPV vaccine to include the vaccination of adolescent males in October of 2011(CDC, 2011). This review sought to include primarily research conducted after this change in the recommendation for HPV vaccination.

# results

Thirty articles were selected to be included in this review. Four articles that would otherwise have been included were not available through the University of Pittsburgh’s PittCatt+ system including three articles that had recently been published electronically ahead of print. Of the articles that were selected 21 (70%) used a survey method, 11 (37%) used qualitative methods, and two (7%) used mixed methods. The number of participants per study ranged from 8 to 1753. Five (17%) studies had less than 50 participants, 13 (43%) studies had between 51 and 200 participants, and 12 (40%) of studies had over 200 participants. Six (20%) studies included participants that were not health care providers and 24 (80%) studies included only healthcare providers. 25 (83%) studies included physicians as participants, 18 (60%) studies included nursing professional as participants, and seven (23%) studies included healthcare providers of professions other than physicians or nurses.

Table 1. Characteristics of Included Publications

|  |  |  |  |
| --- | --- | --- | --- |
|  | | | |
| **Authors/ Year Published** | **Study Design/Location** | **Participants** | **Key Findings** |
| Alexander, Best, Stupiansky, & Zimet, 2015 | Semi-structured interviews, a Midwestern city | 20 pediatricians | * Provider knowledge of the vaccine influenced their recommendation practices * Providers were uncomfortable talking about HPV related anal and penile cancers with adolescent male patients * Some providers were unaware of the ACIP recommendation to vaccinate boys against HPV * Most commonly cited benefit of the vaccine to boys was the prevention of genital warts and male to female HPV transmission |
| Allison, et al., 2016 | Survey administered by mail and the Internet, Nationwide | 582 physicians (pediatric and family medicine specialties) | * Physicians were more likely to recommend the vaccine for girls than boys * Physicians were more likely to recommend the vaccine to older age groups * Physicians will often not bring up HPV vaccination when they know the patient is not sexually active, believe the patient is too young, when the patient is getting other vaccines at that visit, or when they expect the parents to refuse vaccination |
| Berkowitz, Malone, Rodriguez, & Saraiya, 2015 | Annual, web-based survey, Nationwide | 1753 physicians (family medicine, internal medicine, pediatrics, and obstetrics/gynecology specialties) and nurse practitioners | * 14.5% of providers recommended the HPV vaccine to all age-eligible girls * More than 11.0% of providers did not recommend the HPV vaccine including 23.9% of internists * Almost all providers are aware that the HPV vaccine is effective in preventing cervical cancer but less were aware that it can also prevent anal, oropharyngeal, vulvar, and vaginal cancer |
| Bruno, Wilson, Gany, & Aragones, 2014 | Mailed survey, Brooklyn, NY | 121 physicians (family medicine, pediatric, and internal medicine specialties) | * Only 34% of physicians recommended the HPV vaccine regularly to all of their eligible patients * 95% of providers believed that HPV infections and their consequences were serious enough to warrant a vaccination * 72% of providers were unsure about the lasting immunity from the HPV vaccine * 66% of providers reported not having enough time to discuss the vaccine with patients and parents |
| Bynum, et al., 2014  **Table 1 Continued** | Mailed Survey, Florida | 433 physicians (family medicine, pediatrics, and obstetrics/gynecology specialties) | * 74% of physicians recommended the HPV vaccine to 11-12 year old girls * 86% of physicians recommended the HPV vaccine to 13-14 year old girls * 91% of physicians recommended the HPV vaccine to 15-17 year old girls |
| Cody & Lerand, 2013 | Online survey, Wisconsin and Illinois | 130 physicians (pediatrics and family medicine specialties) and nurse practitioners | * 90% of providers surveyed recommended the HPV vaccine to their adolescent patients with disabilities * The main reason cited for not vaccinating adolescent patients with disabilities against HPV was parental refusal * The majority of providers were comfortable discussing sexuality and sexual activity with adolescent patients with disabilities |
| Getrich, et al., 2014 | Semi-structured interviews with providers, urban New Mexico | 52 Total participants, 8 healthcare providers including physicians (pediatric and family practice specialties), physicians’ assistants, and nurse practitioners | * The lack of a vaccination tracking system and reminder capabilities of the clinics was a barrier to administering second and third doses of the vaccine * All physicians held favorable views of the vaccine * Physicians stated that they would give the vaccine to their daughters as a selling point for vaccination |
| Gilkey, et al., 2015 | Online survey, Nationwide | 776 physicians (pediatric and family medicine specialties) | * Less physicians highly endorsed the HPV vaccine than other adolescent vaccinations * Physicians believe that parents would not highly endorse the HPV vaccine but would highly endorse other adolescent vaccinations * Three quarters of physicians believe that excluding the HPV vaccine from school vaccination mandates makes parents think it is less important than other adolescent vaccinations |
| Grimminger, et al., 2013 | Focus groups and a survey, South Dakota Native American tribe | 73 Total participants, 17 tribal healthcare providers | * Tribal healthcare providers were aware of HPV but had limited knowledge and desired more information * Healthcare providers were confused over men’s eligibility to receive the vaccine * Providers expressed perceptions of high and low prevalence of HPV in their community |
| Gross, et al., 2016  **Table 1 Continued** | Semi-structured interviews, University of Texas Medical Branch | 18 physicians (pediatric and obstetrics/gynecology specialties) and nurses | * Providers had overall positive attitudes towards the HPV vaccine and saw it as beneficial to women’s health * Providers were supportive of vaccinating postpartum women * The most important benefit of the vaccine was cited as being cancer prevention |
| Head, Vanderpool, & Mills, 2013 | Semi-structured interviews, Federally Qualified Health Center in rural Appalachian Kentucky | 8 nursing professionals and physician | * Providers believed in the efficacy of the vaccine and supported its use * Barriers to the use of the vaccine included:   + Lack of patient education about the vaccine   + Lack of effective communication by the clinic to remind patients of subsequent visits for the second and third doses |
| Healy, Montesinos, & Middleman, 2014 | Survey, Houston, TX | 506 Total participants, 105 healthcare providers including physicians, nurses, and medical assistants | * Providers perceived parental concern for the safety of vaccines * Providers thought the number of diseases prevented was more important than the number of injections * Provider’s vaccine related beliefs and behaviors differed based on the age of the child |
| Henrikson, Tuzzio, Gilkey, & McRee, 2016 | Secondary analysis of data from two qualitative studies using semi-structured and phone interviews, Minnesota and Washington | 44 physicians, nurse practitioners, and physician assistants | * Providers perceive an age gradient on timely vaccination with no urgency to vaccinate before age 16 * Providers give parents “permission to delay” vaccination as a means of building trust |
| Hudson, et al., 2016 | Semi-structured interviews, Kaiser Permanente Southern California | 61 physicians (pediatric and family medicine specialties), and immunization nurses | * Providers who educate and engage with parents about the HPV vaccine have higher percentages of patients who have been vaccinated * Providers with a higher percentage of vaccinated patients were more likely to express an awareness of and engagement in the language and culture of their patients * Providers with a higher percentage of vaccinated patients were more likely to stress the importance of scheduling appointments for patients to receive the second and third doses of the vaccine |
| Javaid, et al., 2016 | Web-based survey, Texas | 1132 Total participants, 728 healthcare providers including physicians (pediatric, family medicine, obstetrics/gynecology, and other specialties), registered nurses, physicians assistants, licensed vocational nurses, nurse practitioners, medical assistants, and other healthcare professionals  **Table 1 Continued** | * The most frequent barrier to HPV vaccination is, according to providers, the parental perception that it is not necessary to vaccine adolescents that are not sexually active * The provider response to parental concerns includes providing educational materials and documenting the vaccine refusal in order to continue the discussion at the next visit * Only a few providers use reminders to bring patients back for their second and third dose of the vaccine * Only 77% of providers reported always having the vaccine in stock |
| Katz, et al., 2016 | Semi-structured interviews and focus groups, Boston, MA | 84 Total participants, 36 healthcare providers including nurses and pediatricians | * Providers generally perceived the vaccine positively * Providers perceived caregiver reluctance towards the vaccine due to its connection with sexual activity * Lack of time to discuss the HPV vaccine during a visit * Concern for the number of shots given in one visit |
| Kulczycki, Qu, & Shewchuk, 2016 | Survey administered by mail and the Internet, Select states nationwide | 301 physicians (pediatric and family medicine specialties) | * Two thirds of providers were likely to recommend the vaccine to 11-12 year old girls * 24% of providers said they initiated discussions fewer than half the times they had an unvaccinated female patient in their office * A significant proportion of physicians were uncomfortable discussing the HPV vaccine |
| Luque, et al., 2014 | Online, telephone, and paper survey, Georgia Vaccines for Children Providers | 217 physicians (primarily pediatric and family medicine specialties) | * A majority of physicians had good knowledge about HPV infections and the HPV vaccine * A majority of participants reported cost related barriers to vaccination including administrative costs for offering the vaccine * 51% of physicians reported that it is difficult to ensure completion of the 3 dose series * 23% of physicians thought not including the vaccine in school vaccination mandates was a barrier to vaccination |
| McRee, Gilkey, & Dempsey, 2014 | Online survey, Minnesota | 575 physicians (pediatric and family medicine specialties) and nurse practitioners | * Three quarters of providers reported recommending the HPV vaccine to girls aged 11-12 most of the time * Fewer than half reported recommending the vaccine to boys aged 11-12 most of the time * Providers preferred to present the HPV vaccine as an “optional” vaccination   **Table 1 Continued** |
| Nodulman, et al., 2015 | In-depth interviews, New Mexico | 117 Total participants, 7 healthcare providers who were middle school nurses | * School nurses correctly identified what diseases were caused by HPV but were hesitant and unsure of their own knowledge * School nurses were hesitant about the efficacy of the HPV vaccine in preventing HPV infections and not comfortable endorsing the vaccination * Nurses believed that HPV should be included in the middle school health curriculum but were unsure if it was currently included |
| Perkins & Clark, 2013 | Semi-structured interviews, Federally Qualified Community Health Centers in Boston MA | 34 physicians (pediatrics and family medicine specialties) and nurse practitioners | * Patients generally react positively to vaccination when the HPV vaccine is presented as cancer prevention * The majority of patients who refuse the HPV vaccine are white, well educated, and affluent * Patients more readily accept HPV vaccination when there is a long term, trusting relationship between the provider making the recommendation and the patient * Patients are swayed when provider recommendation includes saying they would have their own children receive the HPV vaccine |
| Roland, et al., 2014 | Mailed surveys, Federally Qualified Health Centers in Illinois | 98 primary care providers including physicians, nurse practitioners, certified nurse midwives, and physician assistants | * 93% of providers currently recommended or planned to recommend the HPV vaccine to their patients * Of those providers who recommended the vaccine, 98% recommended it to females aged 13-26, 68% recommended it to females aged 9-12, 16% recommended it to males aged 13-26, and 13% recommended the vaccine to males aged 9-12 * 71% of providers believed that routinely vaccinating female patients would result in fewer abnormal Pap tests * 55% of providers reported that they would not change their screening practices for fully vaccinated females |
| Rosen, Ashwood, & Richardson, 2016 | Paper survey, Ohio Association of School Nurses conference | 145 school nurses and nurses’ assistants | * School nurses have moderate knowledge regarding the HPV virus and HPV vaccine * School nurses view the HPV vaccine positively * School nurses see themselves as in a position to influence parental decisions regarding HPV vaccination * Many school nurses have low self-efficacy regarding their ability to fully educate parents about the HPV vaccine |
| Rosen, Goodson, Thompson, & Wilson, 2015  **Table 1 Continued** | Electronic survey, National Association of School Nurses | 505 school nurses with membership in the National Association of School Nurses | * School nurses have moderate knowledge regarding the HPV virus and the HPV vaccine * School nurses view the HPV vaccine positively * School nurses were mixed in their view of themselves as opinion leaders regarding the HPV vaccine * School nurses did not report doing many activities to educate parents about the HPV virus and the HPV vaccine |
| Scherr, et al., 2016 | Mailed survey, Florida | 355 physicians | * 57.9% of physicians reported being aware of CDC resources for providers about the HPV vaccine * Physicians anticipated parental hesitancy regarding vaccination of males due to skepticism about cancer prevention for males and safety concerns about the HPV vaccine * Physicians expressed hesitancy about the vaccine due to worry about having too many vaccines, distrust of the CDC, and the perception of HPV related cancers in males being rare |
| Sussman, et al., 2015 | Semi-structured interviews and a survey, New Mexico | 25 individuals interviewed and 98 physicians (pediatric and family medicine specialties), nurse practitioners, and physician assistants surveyed | * Physicians reported difficulties with administering the HPV vaccine during sick visits * Physicians emphasized the cancer preventing aspect of the vaccine and were uncomfortable talking about sexual activity with their patients * Physicians were more comfortable vaccinating older adolescents |
| Tom, et al., 2016 | Online survey, Hawaii | 120 physicians (pediatric, family medicine, obstetrics/gynecology, and internal medicine specialties) | * Most providers felt comfortable talking about sexuality with their patients * Only half of provider reported always recommending the HPV vaccine with other adolescent vaccines * Some providers were unsure which cancers were caused by HPV |
| Vadaparampil, Staras, et al., 2013 | Mailed survey, Florida Medicaid providers | 485 physicians | * Providers had higher HPV vaccination rates when they were:   + Pediatricians, not Family Physicians   + Had a private practice   + Had a single specialty practice   + Vaccines For Children providers   + Saw primarily non-Hispanic White patients   + Used Two or more strategies to ensure vaccine series completion   + Administered the HPV Vaccine in their practice   **Table 1 Continued** |
| Vadaparampil, Murphy, et al., 2013 | Mailed survey, National sample | 134 physicians (pediatric, family medicine, obstetrics/ gynecology specialties) | * Physicians stated utilizing electronic reminder systems for ensuring patients received the second and third doses of the HPV vaccine * Physicians believed there was a lack of clarity in the guidelines for HPV vaccination * Physicians expressed a desire for more information regarding the HPV vaccine * 17 physicians did not recommend the HPV vaccination for males |
| White, Waldrop, & Waldrop, 2016 | Online survey, Southeastern US university affiliates | 111 registered nurses | * 78.4% of nurses knew the HPV vaccine was available for both girls and boys * 78.3% of nurses agreed with the statement “HPV infection is common in males” * 90% of participants agreed that males should be vaccinated against HPV * 14% of participants agreed that “vaccination against a sexually transmitted infection may encourage earlier or riskier sexual behavior” |

The 30 articles that met the criteria for selection were reviewed to determine the recent provider perspectives on the HPV vaccine. Specifically, the barriers (Table 1) and facilitators (Table 2) of vaccination from the provider perspective were identified. This review also sought to identify how provider perspectives and knowledge of the vaccine influence their current practices.

## barriers to vaccination

Barriers to vaccination begin before parents and adolescents enter their provider’s office. Even getting the target patients to schedule and attend a preventative care visit can be difficult as adolescents do not see their providers as often as younger children (Bruno, et al, 2014; Getrich, et al, 2014; Sussman, et al., 2015). When a visit does occur, providers perceive their patients and their patients’ parents as having pre-established beliefs about HPV vaccination. Some of these beliefs include religious objections to HPV vaccination, concerns that vaccinating their children against HPV will lead to earlier engagement in sexual activity, and the perception that their child has a low risk of suffering from HPV related conditions and cancers (Alexander, Best, Stupiansky, & Zimet, et al., 2015; Tom, et al., 2016; Head, Vanderpool, & Mills, 2013; Javaid, et al., 2016; Hudson, et al., 2016; Rosen, Ashwood, & Richardson, 2016; Bruno, Wilson, Gany, & Aragones, 2014; Katz, et al., 2016; Vadaparampil, Murphy, et al., 2013; White, Waldrop, & Waldrop, 2016; McRee, Gilkey, & Dempsey, 2014; Scherr, et al., 2016; Grimminger, et al., 2013). Parents often do not believe their child requires protection from a sexually transmitted disease before the initiation of sexual activity (Allison, et al., 2016; Javaid, et al., 2016; McRee, Gilkey, & Dempsey, 2014). Parents of boys may refuse vaccination due to a belief that HPV vaccination is the responsibility of only girls (Alexander, Best, Stupiansky, & Zimet, et al., 2015; Allison, et al., 2016; Javaid, et al., 2016; McRee, Gilkey, & Dempsey, 2014; Luque, et al., 2014; Grimminger, et al., 2013; Roland, et al., 2014; Scherr, et al., 2016; Vadaparampil, Murphy, et al., 2013). In other instances, patients may refuse simply because they do not want to receive a shot or are already receiving other vaccinations and do not want any more on that day (Head, Vanderpool, & Mills, 2013). While many providers only perceive that their patients hold these beliefs, other providers hold these views themselves and so do not recommend the HPV vaccine to some or any patients.

During the visit with the provider, the most serious barrier to the patient being vaccinated is the lack of a provider recommendation (Berkowitz, Malone, Rodriguez, & Saraiya, 2015; Bruno, Wilson, Gany, & Aragones, 2014; Javaid, et al., 2016; McRee, Gilkey, & Dempsey, 2014; Kulczycki, Qu, & Shewchuk, 2016; Alexander, Best, Stupiansky, & Zimet, et al., 2015; Allison, et al., 2016; Tom, et al., 2016; Gross, et al., 2016). The vast majority of providers view themselves as influential in the vaccine decision-making process. And while the majority of providers are in favor of vaccination, many do not recommend the vaccine in such a way as to make it most likely for their patients to be vaccinated that day. Some providers do not have enough time to fully discuss the HPV vaccine and so will either not broach the topic or not adequately address parental and patient concerns (Bruno, Wilson, Gany, & Aragones, 2014; Hudson, et al., 2016; Katz, et al., 2016; McRee, Gilkey, & Dempsey, 2014; Getrich, et al., 2014; Gross, et al., 2016). Discussing HPV vaccination is made less of a priority due to its exclusion from school vaccination mandates (Javaid, et al., 2016; Alexander, Best, Stupiansky, & Zimet, et al., 2015; Tom, et al., 2016; Gilkey, et al., 2015; Luque, et al., 2014). Providers prioritize other issues and other vaccines that they believe will more immediately affect their patients’ lives. In addition, providers will often not offer the vaccine during sick visits due to concerns about patients perceiving a correlation between worsening illness and the vaccine (Gilkey, et al., 2015; Sussman, et al., 2015). Providers fail to recommend the vaccine due to a lack of feeling urgency, discomfort with discussing sexuality and sexually transmitted diseases, especially with young girls and boys, and a belief that vaccination can wait until patients are older (Cody & Lerand, 2013; Sussman, et al., 2015; McRee, Gilkey, & Dempsey, 2014; Javaid, et al., 2016; Allison, et al., 2016). Older girls are the most likely group to receive a strong HPV vaccination recommendation from their providers (Allison, et al., 2016; Berkowitz, Malone, Rodriguez, & Saraiya, 2015; Luque, et al., 2014; Roland, et al., 2014; Sussman, et al., 2015). When providers do intend to strongly recommend the vaccine, it is often mentioned last, perhaps signaling to patients that it is the last priority of their provider (Gilkey, et al., 2015).

Even if a provider recommendation is made, other factors can prevent the vaccination from occurring. Providers and patients may be put off by the actual or perceived cost of the vaccination (Bruno, Wilson, Gany, & Aragones, 2014; Tom, et al., 2016; Luque, et al., 2014; Vadaparampil, Murphy, et al., 2013). Many providers struggle with administrative costs associated with reimbursement of vaccine administration and may fail to offer the vaccine or have it in stock (Kulczycki, Qu, & Shewchuk, 2016; Alexander, Best, Stupiansky, & Zimet, et al., 2015; Tom, et al., 2016; Luque, et al., 2014). Patients are less likely to be vaccinated if their provider must refer them elsewhere for vaccination (Vadaparampil, Staras, et al., 2013; Vadaparampil, Murphy, et al., 2013). After the first dose has been administered, there are often logistical barriers surrounding the receipt of second and third doses (Javaid, et al., 2016; Head, Vanderpool, & Mills, 2013; Kulczycki, Qu, & Shewchuk, 2016; Alexander, Best, Stupiansky, & Zimet, et al., 2015; Tom, et al., 2016; Getrich, et al., 2014; Gross, et al., 2016; Luque, et al., 2014). The significance of these barriers in combination with patients never knowing or seeing the benefits of the vaccine are what providers perceive as the most significant explanations for unacceptably low HPV vaccination rates.

Table 2. Barriers to HPV Vaccination as Described by Providers

|  |
| --- |
| * Lack of provider recommendation for the vaccine * Belief that providing the HPV vaccine will lead to earlier engagement in sexual activity * Safety concerns * Parents’ desire to postpone vaccination of a Sexually Transmitted Disease in adolescents * Providers are more likely to recommend the HPV vaccine to older girls * Belief that children receive too many vaccines * Providers do not have enough time to discuss the vaccine with parents and patients * Cost of the vaccine * Administrative costs associated with reimbursement for the vaccine * Lack of preventive care visits * Perception of unclear guidelines on HPV vaccination * Not necessary to vaccinate adolescents who are not sexually active * Belief that child is at low risk for HPV associated cancers and conditions * Logistical issues with returning for second and third doses * Boys not vaccinated due to perception that HPV vaccine is only for girls * HPV vaccine not included in school vaccination mandates * Concerns about effect of vaccination on sexual behavior * Religious belief * Delay of vaccination when parent wants to consult with non-present spouse or partner * Lack of patient education * Patients do not want to get a shot * Missing provider knowledge about HPV infections and the HPV vaccine * HPV vaccine often discussed last * Physicians do not discuss HPV vaccination during sick visits * Discomfort discussing sexuality and sexually transmitted diseases * Treatment instead of prevention focus on HPV infections * Distrust of CDC guidelines * Physicians refer elsewhere for vaccination |

A compilation of barriers to HPV vaccination described by providers throughout included publications.

## Facilitators to vaccination

In addition to identifying barriers to increased HPV vaccination rates, providers also identified factors they believe facilitate vaccination. Providers experienced patients who were more likely to accept vaccination when the HPV vaccine was presented as cancer prevention, there was a long-term and trusting relationship between the provider and the patient, and the provider was comfortable addressing the issues of sexuality and sexually transmitted diseases (Perkins & Clark, 2013; Sussman, et al., 2015; Tom, et al., 2016). Providers persuaded their patients to accept their recommendation for the HPV vaccine by presenting it with the other adolescent vaccines, providing educational materials, and sharing information about their own children or grandchildren’s receipt of the vaccine (Perkins & Clark, 2013; Javaid, et al., 2016; Hudson, et al., 2016; Vadaparampil, Murphy, et al., 2013; Getrich, et al., 2014). When patients initially refuse vaccination, providers increase vaccination rates by making repetitive recommendations for the vaccine at each subsequent visit (Javaid, et al., 2016; Allison, et al., 2016). After the initial dose has been administered, providers and offices with higher vaccination rates send reminders to patients about the need to receive a second and third dose of the vaccine (Hudson, et al., 2016; Javaid, et al., 2016; Tom, et al., 2016; Vadaparampil, Staras, et al., 2013; Vadaparampil, Murphy, et al., 2013).

Table 3. Facilitators to HPV Vaccination as Described by Providers

|  |
| --- |
| * Long term, trusting relationship between provider making recommendation and patient * HPV vaccine presented as cancer prevention * Television advertisements * Patients are swayed when provider recommendation includes saying they would have their own children receive the HPV vaccine * Providers presenting the HPV vaccine with other vaccinations for 11 year olds * Provision of educational materials to parents * Repetitive recommendations at each visit * Reminders for second and third dose visits * Providers comfortable talking about sexuality with their patients * Provider belief that vaccine is safe and efficacious |

A compilation of facilitators to HPV vaccination described by providers throughout

included publications.

## Provider knowledge

While most providers do have some knowledge of HPV infections and the HPV vaccine, they also have deficiencies in what they know. High provider knowledge is an important aspect in efforts to increase HPV vaccination rates due to the correlation between provider knowledge and their recommendation practices (Alexander, Best, Stupiansky, & Zimet, 2015). Many providers are unclear on the guidelines for HPV vaccination and require additional education. Other providers distrust the quality of vaccine recommendations from the CDC. Providers were often unable to describe what cancers the HPV vaccine can prevent, both specifically in males (Alexander, Best, Supiansky, & Zimet, 2015) and in general (Tom, et al., 2016). Providers are generally aware that the vaccine is effective at preventing cervical cancer and are generally less aware that the vaccine can also prevent anal, oropharyngeal, vulvar, and vaginal cancers (Berkowitz, Malone, Rodriguez, & Saraiya, 2015). School nurses in particular are not confident in their knowledge of the HPV vaccine and are missing key pieces of information, despite correctly identifying which diseases are caused by HPV (Nodulman, et al., 2015; Rosen, Goodson, Thompson, & Wilson, 2015). For example, only 78.3% of nurses agreed with the statement “HPV infection is common in males” (White, Waldrop, & Waldrop, 2016). Their lack of knowledge about the efficacy of the HPV vaccine may be a contributing factor to their hesitancy to endorse the vaccine (Nodulman, et al., 2015). Additionally, only 57.9% of physicians were aware of CDC resources for providers about the HPV vaccine, meaning that over 42.1% of providers do not have access to these useful resources (Scherr, et al, 2016). Physicians expressed a desire for additional information regarding the HPV vaccine (Vadaparampil, Murphy, et al., 2013).

# discussion

In this review, numerous barriers to vaccination were identified. Two of these barriers that are actionable and likely to impact vaccination rates if targeted are the lack of a school vaccination mandate for the HPV vaccine and high administrative costs associated with reimbursement of the vaccine to provider offices. In the United States, three jurisdictions have enacted legislation with requires seventh graders to receive the HPV vaccine: Rhode Island, Virginia, and the District of Columbia (NCSL, 2016). Rhode Island is a strong example of school mandates leading to high HPV vaccination rates as they lead the nation in one dose male, three dose male, one dose female, and three dose female HPV vaccination rates (Reagan-Steiner, et al., 2016).

In addition to requiring the HPV vaccine for school entry, the Rhode Island Department of Health has several other initiatives to support increasing adolescent HPV vaccination rates in their state. One key aspect of Rhode Island’s vaccination structure is that the state purchases vaccines for all of the children in the state and makes them available to providers at no cost to the provider (Washburn, et al., 2016). This structure lessens the barrier of providers’ struggles to stock the vaccine and be reimbursed for its administration. As part of a partnership with the CDC, the Rhode Island Department of Health has engaged in educating the public about the HPV vaccine, implementing a statewide reminder program to bring patients back for their second and third doses of the vaccine, and working with providers to improve their knowledge of the HPV vaccine and HPV related cancers and conditions as well as improving their skill at giving patients an effective recommendation for the vaccine. They have also invested in the education of middle school nurses as a source of information and encouragement for parents and adolescents around the HPV vaccine (Washburn, et al., 2016). Rhode Island’s success shows that future efforts to increase HPV vaccination rates should focus on the recruitment of health care providers as allies in this effort and that including the HPV vaccine in school vaccination mandates has a major impact.

The limitations of this review include its search strategy, scope, and relevance for the future in a dynamic field. Only one researcher reviewed articles and determined if they met the criteria for inclusion. In addition, only one database, PubMed, was used to find articles. The use of other databases may have led to the inclusion of additional articles. This review only focused on recent provider perceptions and older studies were excluded that may have contributed to a fuller understanding of provider perceptions of this vaccine. In addition, only studies in the United States were included, meaning the relevance to global HPV vaccination may be minimal. The challenge of understanding HPV vaccination necessarily requires the viewpoints of parents and patients, which this review did not discuss. In addition, as recently as October 2016 the ACIP has changed their recommendation for HPV vaccination. This change will likely influence the perspectives on the vaccine from various stakeholders including providers. Several of the barriers identified in this review, including the difficulties associated with patients receiving a second and third dose of the vaccine, may have a different significance as this change goes into effect. For this review to be done in a way that fully meets the standards of a systematic review additional researchers would be included to determine if articles meet the criteria for inclusion, additional databases would be used to search for articles, and articles would be assessed for quality with only articles meeting a high quality standard included. In doing a fully systematic review, further results may be identified and the level of evidence for all results would be higher.

This literature review provides insight into what providers are thinking about the HPV vaccine and how they are involving the vaccine in patient visits. A possible next step in this research could be determining what the perceptions of adolescents and their parents are regarding HPV and the HPV vaccine. Providers expressed several beliefs about how they think their patients and their patients’ parents perceive the HPV vaccine. It would be useful to determine in what ways providers are correct, in what ways they are incorrect, and what concerns their patients have that providers have not considered. Both the perspectives identified in this review and the perspectives of other stakeholders are of public health importance for their significance in the ongoing effort to increase HPV vaccination rates in the United States.

# Conclusion

The HPV vaccine is an efficacious new tool in combating cancers in women and men. Despite the ability of this vaccine to prevent future HPV related cancers and conditions, vaccination rates throughout the United States are lower than other adolescent vaccines. This review examined recent provider perspectives of the vaccine and identified the significant barriers and facilitators of vaccination. Moving forward, interventions to increase vaccination rates should focus on improving the frequency and quality of the provider recommendation for the vaccine. These efforts should engage providers and position them as allies in the effort to vaccinate more adolescents. The successes that providers have found in achieving vaccination can guide these efforts. With adequate HPV vaccination rates, thousands of cancer cases will be prevented and HPV related morbidity and mortality reduced.

# bibliography

Alexander, A. B., Best, C., Stupiansky, N., & Zimet, G. D. (2015). A model of health care provider decision making about HPV vaccination in adolescent males. Vaccine, 33(33), 4081-4086. doi:10.1016/j.vaccine.2015.06.085

Allison, M. A., Hurley, L. P., Markowitz, L., Crane, L. A., Brtnikova, M., Beaty, B. L., . . . Kempe, A. (2016). Primary Care Physicians' Perspectives About HPV Vaccine. Pediatrics, 137(2), e20152488. doi:10.1542/peds.2015-2488

Bartlett, J. A., & Peterson, J. A. (2011). The uptake of Human Papillomavirus (HPV) vaccine among adolescent females in the United States: a review of the literature. J Sch Nurs, 27(6), 434-446. doi:10.1177/1059840511415861

Berkowitz, Z., Malone, M., Rodriguez, J., & Saraiya, M. (2015). Providers' beliefs about the effectiveness of the HPV vaccine in preventing cancer and their recommended age groups for vaccination: Findings from a provider survey, 2012. Prev Med, 81, 405-411. doi:10.1016/j.ypmed.2015.10.007

Bruno, D. M., Wilson, T. E., Gany, F., & Aragones, A. (2014). Identifying human papillomavirus vaccination practices among primary care providers of minority, low-income and immigrant patient populations. Vaccine, 32(33), 4149-4154. doi:10.1016/j.vaccine.2014.05.058

Bynum, S. A., Staras, S. A., Malo, T. L., Giuliano, A. R., Shenkman, E., & Vadaparampil, S. T. (2014). Factors associated With Medicaid providers' recommendation of the HPV vaccine to low-income adolescent girls. J Adolesc Health, 54(2), 190-196. doi:10.1016/j.jadohealth.2013.08.006

Centers for Disease Control and Prevention (CDC). (2011). ACIP recommends all 11-12 year-old males get vaccinated against HPV [Press release]

Centers for Disease Control and Prevention (CDC). (2016). CDC recommends only two HPV shots for younger adolescents [Press release]

Centers for Disease Control and Prevention (CDC). Epidemiology and Prevention of Vaccine-Preventable Diseases. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Washington D.C. Public Health Foundation, 2015.

Chesson, H. W., Ekwueme, D. U., Saraiya, M., Dunne, E. F., & Markowitz, L. E. (2014). The estimated impact of human papillomavirus vaccine coverage on the lifetime cervical cancer burden among girls currently aged 12 years and younger in the United States. Sex Transm Dis, 41(11), 656-659. doi:10.1097/OLQ.0000000000000199

Clark, S. J., Cowan, A. E., Filipp, S. L., Fisher, A. M., & Stokley, S. (2016). Parent HPV vaccine perspectives and the likelihood of HPV vaccination of adolescent males. Hum Vaccin Immunother, 12(1), 47-51. doi:10.1080/21645515.2015.1073426

Cody, P. J., & Lerand, S. J. (2013). HPV vaccination in female children with special health care needs. J Pediatr Adolesc Gynecol, 26(4), 219-223. doi:10.1016/j.jpag.2013.03.003

Getrich, C. M., Broidy, L. M., Kleymann, E., Helitzer, D. L., Kong, A. S., Sussman, A. L., & Clinicians, R. N. (2014). Different models of HPV vaccine decision-making among adolescent girls, parents, and health-care clinicians in New Mexico. Ethn Health, 19(1), 47-63. doi:10.1080/13557858.2013.857767

Gilkey, M. B., Malo, T. L., Shah, P. D., Hall, M. E., & Brewer, N. T. (2015). Quality of physician communication about human papillomavirus vaccine: findings from a national survey. Cancer Epidemiol Biomarkers Prev, 24(11), 1673-1679. doi:10.1158/1055-9965.EPI-15-0326

Gilkey, M. B., Moss, J. L., Coyne-Beasley, T., Hall, M. E., Shah, P. D., & Brewer, N. T. (2015). Physician communication about adolescent vaccination: How is human papillomavirus vaccine different? Prev Med, 77, 181-185. doi:10.1016/j.ypmed.2015.05.024

Gross, T. T., Rahman, M., A, M. W., J, M. H., Sarpong, K. O., Rupp, R. E., . . . Berenson, A. B. (2016). Implementation of a Postpartum HPV Vaccination Program in a Southeast Texas Hospital: A Qualitative Study Evaluating Health Care Provider Acceptance. Matern Child Health J. doi:10.1007/s10995-016-2030-0

Head, K. J., Vanderpool, R. C., & Mills, L. A. (2013). Health care providers' perspectives on low HPV vaccine uptake and adherence in Appalachian Kentucky. Public Health Nurs, 30(4), 351-360. doi:10.1111/phn.12044

Healy, C. M., Montesinos, D. P., & Middleman, A. B. (2014). Parent and provider perspectives on immunization: are providers overestimating parental concerns? Vaccine, 32(5), 579-584. doi:10.1016/j.vaccine.2013.11.076

Henrikson, N. B., Tuzzio, L., Gilkey, M. B., & McRee, A. L. (2016). "You're never really off time": Healthcare providers' interpretations of optimal timing for HPV vaccination. Prev Med Rep, 4, 94-97. doi:10.1016/j.pmedr.2016.05.002

Hudson, S. M., Rondinelli, J., Glenn, B. A., Preciado, M., & Chao, C. (2016). Human papillomavirus vaccine series completion: Qualitative information from providers within an integrated healthcare organization. Vaccine, 34(30), 3515-3521. doi:10.1016/j.vaccine.2016.02.066

Javaid, M., Ashrawi, D., Landgren, R., Stevens, L., Bello, R., Foxhall, L., . . . Ramondetta, L. (2016). Human Papillomavirus Vaccine Uptake in Texas Pediatric Care Settings: A Statewide Survey of Healthcare Professionals. J Community Health. doi:10.1007/s10900-016-0228-0

Katz, I. T., Bogart, L. M., Fu, C. M., Liu, Y., Cox, J. E., Samuels, R. C., . . . Schuster, M. A. (2016). Barriers to HPV immunization among blacks and latinos: a qualitative analysis of caregivers, adolescents, and providers. BMC Public Health, 16(1), 874. doi:10.1186/s12889-016-3529-4

Khan, K. S., Kunz, R., Kleijnen, J., & Antes, G. (2003). Five steps to conducting a systematic review. J R Soc Med, 96(3), 118-121.

Krawczyk, A., Perez, S., King, L., Vivion, M., Dube, E., & Rosberger, Z. (2015). Parents' decision-making about the human papillomavirus vaccine for their daughters: II. Qualitative results. Hum Vaccin Immunother, 11(2), 330-336. doi:10.4161/21645515.2014.980708

Kulczycki, A., Qu, H., & Shewchuk, R. (2016). Primary Care Physicians' Adherence to Guidelines and Their Likelihood to Prescribe the Human Papillomavirus Vaccine for 11- and 12-Year-Old Girls. Womens Health Issues, 26(1), 34-39. doi:10.1016/j.whi.2015.07.012

Luque, J. S., Tarasenko, Y. N., Dixon, B. T., Vogel, R. L., & Tedders, S. H. (2014). Recommendations and administration of the HPV vaccine to 11- to 12-year-old girls and boys: a statewide survey of Georgia vaccines for children provider practices. J Low Genit Tract Dis, 18(4), 298-303. doi:10.1097/LGT.0000000000000011

Markowitz, L. E., Dunne, E. F., Saraiya, M., Chesson, H. W., Curtis, C. R., Gee, J., . . . Prevention. (2014). Human papillomavirus vaccination: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep, 63(RR-05), 1-30.

Markowitz, L. E., Dunne, E. F., Saraiya, M., Lawson, H. W., Chesson, H., Unger, E. R., . . . Advisory Committee on Immunization, P. (2007). Quadrivalent Human Papillomavirus Vaccine: Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep, 56(RR-2), 1-24.

McRee, A. L., Gilkey, M. B., & Dempsey, A. F. (2014). HPV vaccine hesitancy: findings from a statewide survey of health care providers. J Pediatr Health Care, 28(6), 541-549. doi:10.1016/j.pedhc.2014.05.003

Mullins, T. L., Griffioen, A. M., Glynn, S., Zimet, G. D., Rosenthal, S. L., Fortenberry, J. D., & Kahn, J. A. (2013). Human papillomavirus vaccine communication: perspectives of 11-12 year-old girls, mothers, and clinicians. Vaccine, 31(42), 4894-4901. doi:10.1016/j.vaccine.2013.07.033

National Conference of State Legislatures (NCSL). (2016). HPV Vaccine: State Legislation and Statutes. Retrieved from www.ncsl.org

Nodulman, J. A., Starling, R., Kong, A. S., Buller, D. B., Wheeler, C. M., & Woodall, W. G. (2015). Investigating stakeholder attitudes and opinions on school-based human papillomavirus vaccination programs. J Sch Health, 85(5), 289-298. doi:10.1111/josh.12253

Perkins, R. B., & Clark, J. A. (2013). Providers' perceptions of parental concerns about HPV vaccination. J Health Care Poor Underserved, 24(2), 828-839. doi:10.1353/hpu.2013.0080

Reagan-Steiner, S., Yankey, D., Jeyarajah, J., Elam-Evans, L. D., Curtis, C. R., MacNeil, J., . . . Singleton, J. A. (2016). National, Regional, State, and Selected Local Area Vaccination Coverage Among Adolescents Aged 13-17 Years - United States, 2015. MMWR Morb Mortal Wkly Rep, 65(33), 850-858. doi:10.15585/mmwr.mm6533a4

Roland, K. B., Benard, V. B., Greek, A., Hawkins, N. A., & Saraiya, M. (2014). Primary care providers human papillomavirus vaccine recommendations for the medically underserved: a pilot study in U.S. Federally Qualified Health Centers. Vaccine, 32(42), 5432-5435. doi:10.1016/j.vaccine.2014.07.098

Rosen, B. L., Ashwood, D., & Richardson, G. B. (2016). School Nurses' Professional Practice in the HPV Vaccine Decision-Making Process. J Sch Nurs, 32(2), 138-148. doi:10.1177/1059840515583312

Rosen, B. L., Goodson, P., Thompson, B., & Wilson, K. L. (2015). School nurses' knowledge, attitudes, perceptions of role as opinion leader, and professional practice regarding human papillomavirus vaccine for youth. J Sch Health, 85(2), 73-81. doi:10.1111/josh.12229

Scherr, C. L., Augusto, B., Ali, K., Malo, T. L., & Vadaparampil, S. T. (2016). Provider-reported acceptance and use of the Centers for Disease Control and Prevention messages and materials to support HPV vaccine recommendation for adolescent males. Vaccine, 34(35), 4229-4234. doi:10.1016/j.vaccine.2016.06.037

Schmidt-Grimminger, D., Frerichs, L., Black Bird, A. E., Workman, K., Dobberpuhl, M., & Watanabe-Galloway, S. (2013). HPV knowledge, attitudes, and beliefs among Northern Plains American Indian adolescents, parents, young adults, and health professionals. J Cancer Educ, 28(2), 357-366. doi:10.1007/s13187-013-0468-y

Smulian, E. A., Mitchell, K. R., & Stokley, S. (2016). Interventions to increase HPV vaccination coverage: A systematic review. Hum Vaccin Immunother, 12(6), 1566-1588. doi:10.1080/21645515.2015.1125055

Sussman, A. L., Helitzer, D., Bennett, A., Solares, A., Lanoue, M., & Getrich, C. M. (2015). Catching Up With the HPV Vaccine: Challenges and Opportunities in Primary Care. Ann Fam Med, 13(4), 354-360. doi:10.1370/afm.1821

Tom, A., Robinett, H., Buenconsejo-Lum, L., Soon, R., Hamilton, M., Francisco-Natanauan, P., . . . Hernandez, B. Y. (2016). Promoting and Providing HPV Vaccination in Hawaii: Barriers Faced by Health Providers. J Community Health, 41(5), 1069-1077. doi:10.1007/s10900-016-0191-9

Vadaparampil, S. T., Murphy, D., Rodriguez, M., Malo, T. L., & Quinn, G. P. (2013). Qualitative responses to a national physician survey on HPV vaccination. Vaccine, 31(18), 2267-2272. doi:10.1016/j.vaccine.2013.02.063

Vadaparampil, S. T., Staras, S. A., Malo, T. L., Eddleton, K. Z., Christie, J., Rodriguez, M., . . . Shenkman, E. A. (2013). Provider factors associated with disparities in human papillomavirus vaccination among low-income 9- to 17-year-old girls. Cancer, 119(3), 621-628. doi:10.1002/cncr.27735

Washburn, T., Devi Wold, A., Raymond, P., Duggan-Ball, S., Marceau, K., & Beardsworth, A. (2016). Current initiatives to protect Rhode Island adolescents through increasing HPV vaccination. Hum Vaccin Immunother, 12(6), 1633-1638. doi:10.1080/21645515.2016.1161460

White, L., Waldrop, J., & Waldrop, C. (2016). Human Papillomavirus and Vaccination Of Males: Knowledge and Attitudes Of Registered Nurses. Pediatr Nurs, 42(1), 21-30, 35.

Widman, C. A., Rodriguez, E. M., Saad-Harfouche, F., Twarozek, A. M., Erwin, D. O., & Mahoney, M. C. (2016). Clinician and Parent Perspectives on Educational Needs for Increasing Adolescent HPV Vaccination. J Cancer Educ. doi:10.1007/s13187-016-